

REMARKS

Claims 1, 3-18, 20, 22, 25, and 26 are pending and under consideration. Claim 26 has been added. Support for new claim 26 may be found in claim 17 as originally filed, and in the specification at page 5, line 11, page 11, lines 8-31, page 13, lines 1 and 10, and page 16, line 24. Further reconsideration is requested based on the foregoing amendment and the following remarks.

Advisory Action Mailed December 17, 2008:

The Applicants appreciate the consideration given to their arguments as evidenced by the Advisory Action mailed December 17, 2008 (hereinafter "Advisory Action"), and the entry of the amendment filed December 9, 2008. The Applicants, however, are disappointed that their arguments were not found to be persuasive.

The Advisory Action asserts in the last line of the first paragraph on the continuation sheet that:

Bigo teaches in FIG. 1 results for RZ as well as NRZ.

The fourth clause of new claim 26, consequently, recites:

Modulating said signal light as only an NRZ modulation type.

Since, as noted in the Advisory Action, Bigo teaches in FIG. 1 results for RZ as *well* as NRZ, Bigo does not show "modulating said signal light as only an NRZ modulation type," as recited in new claim 26.

The Advisory Action asserts in the second paragraph on the continuation sheet that:

The formula of Miyamoto et al. is not written in the same as that of claim 1. However, the two formulas are mathematically equivalent.

This is submitted to be without basis. The recited transmission characteristic, in fact, differs from the transmission characteristic of Miyamoto by at least a factor of 10 and a log. The transmission characteristic of Miyamoto, it should be noted, is already in decibels. The transmission characteristic of Miyamoto is not, consequently, equivalent mathematically to the recited transmission characteristic.

The Advisory Action asserts further in the second paragraph on the continuation sheet that:

Where the claimed differences involve the substitution of interchangeable or replaceable equivalents and the reason for the selection of one equivalent for another was not to solve an existent problem, such substitution has been judicially determined to have been obvious. See *In re Ruff*, 118, USPQ 343 (CCPA 1958).

This is also submitted to be without basis. As provided by the M.P.E.P 2144.06(II), in fact, in order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and cannot be based on applicant's disclosure or the mere fact that the components at issue are functional or mechanical equivalents. *In re Ruff*, 256 F.2d 590, 118 USPQ 340 (CCPA 1958).

Here, the recited transmission characteristic differs from the transmission characteristic of Miyamoto by at least a factor of 10 and a log, as discussed above. Consequently, the equivalence of the transmission characteristic of Miyamoto to the recited transmission characteristic is not recognized in the prior art, and thus would not amount to a rationale for supporting an obviousness rejection. *In re Ruff*.

Further reconsideration is thus requested.

Claim Rejections - 35 U.S.C. § 103:

Claims 1 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo et al., "Improving Spectral Efficiency by Ultra-Narrow Optical Filtering to Achieve MultiTerabit/s Capacities", OFC 2002, 17-22 March 2002 (hereinafter "Bigo") in view of U.S. Patent No. 6,865,348 to Miyamoto et al. (hereinafter "Miyamoto"). The rejection is traversed. Reconsideration is earnestly solicited.

Claim 1 recites:

Maximizing a product of a transmission distance and a transmission capacity of the system.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," as recited in claim 1. The final Office Action, in fact, does not even assert that Bigo *does* show "maximizing a product of a transmission distance and a transmission capacity of the system," as recited in claim 1.

Miyamoto is not "maximizing a product of a transmission distance and a transmission capacity of the system" either, and thus cannot make up for the deficiencies of Bigo with respect to claim 1. Thus, even if Bigo and Miyamoto were combined as proposed in the final Office

Action, claim 1 would not result.

Claim 1 recites further:

Wherein the type of modulation of said signal light is an NRZ modulation type.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "wherein the type of modulation of said signal light is an NRZ modulation type," as recited in claim 1. Bigo, to the contrary, only describes a specific example in which a 3 dB-bandwidth of a branching filter in the receiving side is optimized at a value that minimizes cross-talk. In particular, as described in at the end of the first paragraph in the first column in section 2, at page 363 of Bigo:

The 3 dB-bandwidth of the demultiplexing optical filter was optimized in back-to-back so as to minimize cross-talk, at 0.6 nm for NRZ format and 0.65 nm for RZ format.

From this description, it can be understood that "minimizing the crosstalk" about each of NRZ and RZ can be achieved by filtering at the time of branching at the receiving side. This description, however, does not indicate "using NRZ gives better spectrum efficiency," contrary to the assertion in the final Office Action, let alone "wherein the type of modulation of said signal light is an NRZ modulation type," as recited in, for example, claim 1. Bigo, consequently, is not "maximizing a product of a transmission distance and a transmission capacity of the system," as recited in, for example, claim 1.

Bigo, in particular, *evaluates* both formats, the RZ and the NRZ, as described in section 2, in the third full paragraph of the first column at page 363, without settling on one or the other. According to Bigo, in fact, the NRZ and the RZ formats turn out to have almost the *same* average sensitivity, as described in section 2 in the first paragraph of the second column of at page 363.

The technical point indicated in Bigo is actually at the end of the second paragraph in the second column at page 363, in section 2:

With narrow filters at Tx, RZ recovers in WDM the advantage over NRZ it has when a single channel is transmitted.

Bigo describes the RZ format as recovering the better sensitivity performance over the NRZ seen in single-channel mode, rather than describing "the type of modulation of said signal light is an NRZ modulation type," as recited in, for example, claim 1. That is, Bigo describes using RZ to perform filtering as effective on the sending side as well as on the receiving side, rather than describing that "the type of modulation of said signal light is an NRZ modulation

type," which allows "maximizing a product of a transmission distance and a transmission capacity of the system," as recited in, for example, claim 1.

Bigo, moreover, relates to a WDM transmission system that has centered optical filters on each channel before wavelength multiplexing at the Tx end. Bigo uses the WDM transmission system for simulating channels using either Non-Return-to-Zero (NRZ) or Return-to-Zero (RZ) formats. Bigo states that strong filtering at Tx has benefits for *both* formats in back-to-back, but the RZ format recovers the *better sensitivity performance over NRZ* seen in single-channel mode, in the last paragraph of section 2, at column 2, page 363. After transmission, strong filtering at Tx is also found to reduce transmission impairments, *but only for RZ format*. This is to be contrasted with claim 1, in which the "signal light is an NRZ modulation type."

Bigo states further that the Tx optical filtering applied to RZ format not only reduces channel linear crosstalk (Fig. 1), and thus improves the back-to-back performance, but also improves the transmission quality, whereas *it only slightly reduces linear cross-talk for NRZ*, in the last paragraph of section 2, at column 2, page 363. With narrow filters at Tx, RZ recovers in WDM the *advantage over NRZ* it has when a single channel is transmitted, in the last paragraph of section 2, at column 2, page 363. This is to be contrasted with claim 1, in which the "signal light is an NRZ modulation type."

Bigo teaches that the spectrum efficiency *is substantial for the RZ format but is minimal in relation to the NRZ format*. This is to be contrasted with claim 1, in which the "signal light is an NRZ modulation type."

Miyamoto, for its part, relates to a system that includes generating a partial response signal by converting a binary NRZ signal from a digital signal source, modulating the optical pulse signal passed on the partial response signal, and *outputting a binary RZ modulated signal*. In particular, as described in the Abstract:

The operation includes receiving a clock signal from a system clock source; modulating a single mode optical signal based on the clock signal and generating an optical pulse signal having two longitudinal modes, the frequency interval thereof being $n \times B$, n being a natural number and B being a transmission speed; generating a partial response signal by converting a binary NRZ signal from a digital signal source in synchronism with the system clock source; and modulating the optical pulse signal based on the partial response signal, and outputting a binary RZ modulated signal.

Since Miyamoto is outputting a binary RZ modulated signal, Miyamoto does not show "wherein the type of modulation of said signal light is an NRZ modulation type," as recited in

claim 1.

Claim 1 recites:

$$T(f) = 10 \cdot \log \left[\exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left(\frac{|f - f_c|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB})$$

Neither Bigo nor Miyamoto teaches, discloses, or suggests

$$"T(f) = 10 \cdot \log \left[\exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left(\frac{|f - f_c|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB}),"$$

as recited in claim 1.

The final Office Action acknowledges this deficiency with respect to Bigo in section 2, at page 2, and seeks to compensate for it by combining Bigo with Miyamoto. As described at column 30, lines 53 and 54 of Miyamoto, however, the transmission characteristics of the super Gaussian filter shown in Miyamoto are indicated by:

$$T(f) = T_0 \exp \left\{ -(\ln 2) \cdot (2f/B)^{2m} \right\}$$

Thus, even if Bigo and Miyamoto were combined as proposed in the final Office Action, claim 1 would not result.

Miyamoto, moreover, does not even use a super Gaussian filter. Miyamoto, rather, rejects the super Gaussian filters in favor of an arrayed-waveguide grating (AWG) type filter. In particular, as described at column 30, line 51:

An actual (actually-used) flat-top type AWG filter.

It is submitted, therefore, that persons of ordinary skill in the art who read Miyamoto for all it contained at the time the invention was made would not have modified Bigo as proposed in the final Office Action, since Miyamoto himself rejects a super Gaussian filter in favor of the AWG filter. Claim 1 is submitted to be allowable. Withdrawal of the rejection of claim 1 is earnestly solicited.

Claim 17:

Claim 17 recites:

Wherein the type modulation of said signal light is an NRZ modulation type.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "wherein the type modulation

of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1.

Claim 17 recites further:

A product of a transmission distance and a transmission capacity becomes maximum.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "a product of a transmission distance and a transmission capacity becomes maximum," as discussed above with respect to the rejection of claim 1.

Claim 17 recites:

$$T(f) = 10 \cdot \log \left[\exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left(\frac{|f - f_c|}{\Delta f / 2} \right)^{2n} \right\} \right] \quad (\text{dB})$$

neither Bigo nor Miyamoto teaches, discloses, or suggests

$$"T(f) = 10 \cdot \log \left[\exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left(\frac{|f - f_c|}{\Delta f / 2} \right)^{2n} \right\} \right] \quad (\text{dB}),"$$
 as discussed above with respect to the

rejection of claim 1. Thus, even if Bigo and Miyamoto were combined as proposed in the final Office Action, claim 17 would not result. Miyamoto, moreover, rejects the super Gaussian filters in favor of an arrayed-waveguide grating (AWG) type filter, as also discussed above with respect to the rejection of claim 1. Claim 17 is the submitted to be allowable, for at least those reasons discussed above with respect to the rejection of claim 1. Withdrawal of the rejection of claim 17 is earnestly solicited.

Claims 3-12:

Claims 3-12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo and Miyamoto in view of U.S. Patent No. 6,496,297 to Frankel et al. (hereinafter "Frankel"). The rejection is traversed. Reconsideration is earnestly solicited.

Claims 3-12 depend from claim 1 and add additional distinguishing elements. Neither Bigo nor Miyamoto teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," or "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Frankel does not either, and thus cannot make up for the deficiencies of either Bigo or Miyamoto with respect to any of claims 3-12. Thus, even if Bigo, Miyamoto, and Frankel were

combined as proposed in the final Office Action, claims 3-12 would not result. Claims 3-12 are thus also submitted to be allowable. Withdrawal of the rejection of claims 3-12 is earnestly solicited.

Claim 13:

Claim 13 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo and Miyamoto in view of Ramaswami et al., "Optical Networks", second Edition by Ramaswami et al., Academic Press, 2002, Published 12 October 2001 pp. 139-143 (hereinafter "Ramaswami"). The rejection is traversed. Reconsideration is earnestly solicited.

Claim 13 depends from claim 1 and adds additional distinguishing elements. Neither Bigo nor Miyamoto teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," or "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Ramaswami does not either, and thus cannot make up for the deficiencies of either Bigo or Miyamoto with respect to claim 13. Thus, even if Bigo, Miyamoto, and Ramaswami were combined as proposed in the final Office Action, claim 13 would not result. Claim 13 is thus also submitted to be allowable. Withdrawal of the rejection of claim 13 is earnestly solicited.

Claim 14:

Claim 14 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo, Miyamoto and Frankel in view of Ramaswami. The rejection is traversed. Reconsideration is earnestly solicited.

Claim 14 depends from claim 1 and adds additional distinguishing elements. Neither Bigo, Miyamoto, Frankel, nor Ramaswami teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," or "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claims 1 and 13. Thus, even if Bigo, Miyamoto, Frankel, and Ramaswami were combined as proposed in the final Office Action, claim 14 would not result. Claim 14 is thus also submitted to be allowable. Withdrawal of the rejection of claim 14 is earnestly solicited.

Claim 15:

Claim 15 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo, Miyamoto, and Frankel in view of U.S. Patent Application Publication No. 2002/0025111 to Koshi et al. (hereinafter "Koshi"). The rejection is traversed. Reconsideration is earnestly solicited.

Claim 15 depends from claim 1 and adds additional distinguishing elements. Neither Bigo, Miyamoto, nor Frankel teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," or "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Koshi does not either, and thus cannot make up for the deficiencies of either Bigo, Miyamoto, or Frankel with respect to claim 15. Thus, even if Bigo, Miyamoto, Frankel, and Koshi were combined as proposed in the final Office Action, claim 15 would not result. Claim 15 is thus also submitted to be allowable. Withdrawal of the rejection of claim 15 is earnestly solicited.

Claims 16 and 25:

Claims 16 and 25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo and Miyamoto in view of U.S. Patent No. 6,690,886 to Guy (hereinafter "Guy"). The rejection is traversed. Reconsideration is earnestly solicited.

Claim 16 depends from claim 1 and adds additional distinguishing elements. Neither Bigo nor Miyamoto teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity of the system," or "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Guy does not either, and thus cannot make up for the deficiencies of either Bigo or Miyamoto with respect to claim 16. Thus, even if Bigo, Miyamoto, and Guy were combined as proposed in the final Office Action, claim 16 would not result. Claim 16 is thus also submitted to be allowable. Withdrawal of the rejection of claim 16 is earnestly solicited.

Claim 25:

Claim 25 recites:

Wherein the type of modulation of said signal light is an NRZ modulation type.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Guy does not either, and thus cannot make up for the deficiencies of either Bigo or Miyamoto with respect to claim 25. Thus, even if Bigo, Miyamoto, and Guy were combined as proposed in the final Office Action, claim 25 would not result.

Claim 25 recites:

$$T(f) = 10 \cdot \log \left[\exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left(\frac{|f - fc|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB})$$

neither Bigo nor Miyamoto teaches, discloses, or suggests

$$"T(f) = 10 \cdot \log \left[\exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left(\frac{|f - fc|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB}),"$$
 as discussed above with respect to the

rejection of claim 1. Thus, even if Bigo and Miyamoto were combined as proposed in the final Office Action, claim 25 would not result. Miyamoto, moreover, rejects the super Gaussian filters in favor of an arrayed-waveguide grating (AWG) type filter, as also discussed above with respect to the rejection of claim 1. Claim 25 is thus also submitted to be allowable. Withdrawal of the rejection of claim 25 is earnestly solicited.

Claims 18, 20, and 22:

Claims 18, 20, and 22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bigo and Miyamoto in view of U.S. Patent No. 7,035,044 to Silverberg et al. (hereinafter "Silverberg"). The rejection is traversed. Reconsideration is earnestly solicited.

Claims 18, 20, and 22 recite:

Wherein the type of modulation of said signal light is an NRZ modulation type.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "wherein the type of modulation of said signal light is an NRZ modulation type," as discussed above with respect to the rejection of claim 1. Silverberg does not either, and thus cannot make up for the deficiencies of either Bigo or Miyamoto with respect to claims 18, 20, and 22. Thus, even if Bigo, Miyamoto, and Silverberg were combined as proposed in the final Office Action, claims 18, 20, and 22 would not result.

Claims 18, 20, and 22 recite:

$$T(f) = 10 \cdot \log \left[\exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left(\frac{|f - fc|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB})$$

neither Bigo nor Miyamoto teaches, discloses, or suggests

$$"T(f) = 10 \cdot \log \left[\exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left(\frac{|f - fc|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB}),"$$
 as discussed above with respect to the

rejection of claim 1. Thus, even if Bigo and Miyamoto were combined as proposed in the final

Office Action, claims 18, 20, and 22 would not result. Miyamoto, moreover, rejects the super Gaussian filters in favor of an arrayed-waveguide grating (AWG) type filter, as also discussed above with respect to the rejection of claim 1. Claims 18, 20, and 22 are thus also submitted to be allowable. Withdrawal of the rejection of claims 18, 20, and 22 is earnestly solicited.

New Claim 26:

Claim 26 recites:

Modulating said signal light as only an NRZ modulation type.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "modulating said signal light as only an NRZ modulation type," as recited in claim 26. Bigo, rather, teaches in FIG. 1 results for RZ as well as NRZ, as noted in the Advisory Action.

Claim 26 recites further:

Maximizing a product of a transmission distance and a transmission capacity by setting a bit rate and frequency spacing of the signal lights.

Neither Bigo nor Miyamoto teaches, discloses, or suggests "maximizing a product of a transmission distance and a transmission capacity by setting a bit rate and frequency spacing of the signal lights," as discussed above with respect to the rejection of claim 1.

Claim 26 recites further:

$$T(f) \approx 10 \cdot \log \left[\exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left(\frac{|f - f_c|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB})$$

neither Bigo nor Miyamoto teaches, discloses, or suggests

" $T(f) \approx 10 \cdot \log \left[\exp \left\{ -2 \cdot \ln \sqrt{2} \cdot \left(\frac{|f - f_c|}{\Delta f/2} \right)^{2n} \right\} \right] \quad (\text{dB})$," as discussed above with respect to the

rejection of claim 1. Thus, even if Bigo and Miyamoto were combined as proposed in the final Office Action, claim 26 would not result. Miyamoto, moreover, rejects the super Gaussian filters in favor of an arrayed-waveguide grating (AWG) type filter, as also discussed above with respect to the rejection of claim 1. Claim 26 is the believed to be allowable. Withdrawal of the rejection of claim 26 is earnestly solicited.

Conclusion:

Accordingly, in view of the reasons given above, it is submitted that all of claims 1, 3-18,

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20, 22, 25, and 26 are allowable over the cited references. Allowance of all claims 1, 3-18, 20, 22, 25, and 26 and of this entire application is therefore respectfully requested.

Finally, if there are any formal matters remaining after this response, the Examiner is invited to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing this Amendment, please charge them to our Deposit Account No. 19-3935.

Respectfully submitted,

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